THE METAL INDUSTRY

With which is Incorporated The Aluminum World,
The Brass Founder and Finisher and Electro Platers Review.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

ALUMINUM · NICKEL · SILVER · GOLD

COPPER · TIN · LEAD · ZINC

METALLOGRAPHY · BRASS · METALLURGY

ROLLING · DRAWING · STAMPING · SPINNING · TUBE-MAKING · POLISHING ·

MELTING · CASTING · REFINING · SOLDERING · BRAZING · PLATING ·

BRONZE

OLD SERIES Vol. IX. No. 10
Vol. I., No. 10 NEW SERIES

LABOR OMNIA VINCIT
OCTOBER, 1903

NEW YORK.

61 BEEKMAN ST.

$1.00 PER YEAR 10 CTS PER COPY

Entered February 10, 1903, at New York, N. Y., as second-class matter under act of Congress. March 3, 1879.

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THE METAL INDUSTRY
AND
The ALUMINUM WORLD
AND
The BRASS FOUNDER AND FINISHER
AND
ELECTRO PLATERS REVIEW

PUBLISHED MONTHLY BY

THE METAL INDUSTRY PUBLISHING COMPANY,

(Incorporated)

61 Beckman Street, New York

PALMER H. LANGDON, - - - - - *Publisher*
ERWIN S. SPERRY, - - - - - - *Editor*
JOHN B. WOODWARD, - - - - - *Director*

Subscription Price $1.00 per year, postpaid to any part of the world. Single copies, 10 cents

ADVERTISING RATES ON APPLICATION

Entered February 10, 1903, at New York, N. Y., as Second Class Matter Under Act of Congress March 3, 1879.

METAL THIEVERY.

Every company or individual who manufactures or deals in metals undoubtedly loses more or less of this commodity through the stealing by its employees. In the case of the cheaper metals, such thievery is usually not sufficient to cause any severe financial loss, although instances have been known where the depredations have been deliberately planned and carried on for a long period, and have thus resulted in the removal of much metal. Brass, copper, zinc, lead or tin are readily disposed of to the various junk dealers, and recent legislation has enacted laws with the intention of making it as difficult as possible to sell this material. How effectually such laws will work remains to be demonstrated, but in the case of the copper and brass manufacturers careful vigilance is required, especially with their cheap labor, to frustrate any attempt at thieving, as no laws will prevent the unscrupulous junk dealer from finding some way to receive and dispose of the stolen goods.

In the case of the precious metals, silver and gold, the problem becomes radically complex on account of the value of the metal. An employee may, with much difficulty, carry away five or ten pounds of copper without detection and sell the same for fifty or seventy-five cents, but sooner or later the careful scrutiny of the watchman at the door or the foreman or superintendent will reveal the presence of the metal upon the thief's person. Not so, however, with the precious metals, as one may readily carry away several dollars' worth of silver and hundreds' worth of gold without any outward sign of the bulging pocket or bootleg being manifested.

Recent instances of such metal thievery has been brought to light in the detection and arrest of employees of the International Silver Company, whose factories at Wallingford and Meriden, Conn., have been robbed of some $5,000 worth of silver by such persons. In this case sheet silver was stolen, and after a considerable accumulation was made it was disposed of to a so-called "fence." Such fences* exist in all large cities, and render it easy for the thief to dispose of his plunder.

*A fence, in the parlance of thieves, is the medium through which stolen goods are disposed of. It is usually persons who are as guilty as the thieves themselves and know full well the origin of the goods.

It is a noteworthy fact, that, as far as gold or any metal containing gold (gold bullion) is concerned, the United States Government is the most flagrant example of the "fence" in existence at the present. Required by law to purchase all gold that is offered, the U. S. Assay Office in New York city and the mints buy, without question, any bullion of this nature that is submitted. An express car may have been robbed of its contents, the "clean-up" of some mine, or a house pilfered and the favorite jewelry taken. These may be taken to the aforesaid establishments, and, after an assay has been made to determine the gold fineness, the party may, without any questions being asked, receive his money. The only requirement is that the value shall be $100 or more.

We do not wish to have it inferred that our Government is an accomplice to crime, but the law requires all bullion to be purchased that is offered, and, of course, no discrimination can be made. If required, however, the Government officials use all possible vigilance to aid in the capture of thieves, but the ready fusibility of gold bullion renders its identity easily impossible, and, unless requested, no questions are asked when a quantity of gold bullion is offered. It is a subject of frequent comment, however, that laws are made to prevent the junk dealer from becoming a "fence," while the Government itself is undoubtedly the largest one in existence.

THE TRIUMPH OF BRONZE.

Again Yankee ingenuity and skill has surpassed that of the Briton and the Reliance, like her predecessors, has prevented the cup from leaving our own country. That the Shamrock III. is a good boat is certain; that the Reliance is a better one has been demonstrated.

It would not be right to say that the Reliance won because she possesses a bronze hull, but we believe that this was one of the number of conditions which brought about the culmination of the victory. The hull of the Shamrock is of enamelled steel, while that of the Reliance is composed of Tobin bronze, strong, non-corrosive and susceptible of a high polish. The fact that this alloy remains bright under the corrosive action of sea water has reacted, as it has before, for the good of the cause.

It is to the credit of The Ansonia Brass and Copper Company, who have furnished the bronze for our last three cup defenders, that each time a material was desired the Herreshoffs turned in its direction. We are pleased to offer our congratulations for the ability displayed in the manufacture of the bronze, and it is a source of gratification to feel that our brass mills, as well as our shipbuilders, lead the world.

Rumors, said to be on good authority, exist that a new brass rolling mill is about to start in the Naugatuck valley. Up to the time of our going to press, we are unable to obtain any further information, but presume it is the revival of a similar report made a few months ago.

THE CONSOLIDATED LAKE SUPERIOR COMPANY.

The "flunk" of this company is only another example of an enterprise started on a gigantic scale and finally forced to the wall. Such cases are not by any means rare, and in this, as in others, history simply repeats itself. Our strongest and greatest industries have, like the proverbial oak tree, grown from a small beginning.

This company proposed to do many things, and some have been carried out, but these have been in the line of iron and steel pulp manufacture, etc. The proposition, however, which interests our side of the question is the one to embark in the rolling of copper, brass and nickel alloys. Stimulated by its control of copper and nickel deposits, this company at first intended to enter the rolling mill business, but later abandoned the idea, and contracted with a Naugatuck Valley brass mill for the furnishing of cupro-nickel (an alloy of copper and nickel), made directly from the ore. The ores which this company control contain both copper and nickel, and it was its intention to avoid the expensive process of parting the two metals and reduce them both simultaneously with the production of the alloy of copper and nickel.

This is certainly an interesting proposition from a smelting standpoint, as the cost is greatly reduced thereby, but we scarcely believe such material would answer for the manufacture of German silver, on account of the difficulty of freeing the metal from the last traces of dangerous impurities. German silver is very sensitive to such foreign elements, and only the highest grade of nickel is used in its manufacture; even then enough trouble is experienced. We have no information about the use of this cupro-nickel made from the ore, except the statement that: "The fulfillment of a big contract with a Connecticut firm to take cupro-nickel is surrounded with much uncertainty."

WONDERFUL PRODUCTS.

The tempered copper man has again "broken out," and this time the East gets the honor. James H. Duffy, of Each Machias, Maine, is the happy man, and claims to have discovered the long-lost art (?) of tempering copper. He first made razors, hatchets, knives and similar edge tools, and following in the wake of the orthodox tempered copper man, says that it makes excellent journal bearings. This is not surprising, for few alloys or metals have been discovered but what make excellent journal bearings (until tried). Sometimes the users wish they hadn't tried them. All the saw mills of East Machias are said to be equipped with these bearings. Some Lochinvar came "out of the West" in the shape of a sawmill man, and tried to buy the secret, but Mr. Duffy refuses to sell.

While the East gets its share of tempered copper glory the West comes in for its own portion. J. La Rix, of Merlin, Oregon, claims to have succeeded in making silver from gold (what the object is he does not say), and also has discovered a new metal, which he modestly calls Rixam. "By reducing the number of ions in the gold atom I obtain silver," he says. It is to be regretted that the Secret Service officers have, for the time being, disturbed the culmination of the process, or Mr. La Rix might have succeeded in reversing his process.

METAL SPINNING—A DEFINITION.

By Winslow Goodwin.

Metal spinning is a subject which receives but scant notice in technical literature and is evidently an unknown quantity to lexicographers and compilers of encyclopedias. Webster's Unabridged Dictionary has no reference to the art. The Encyclopedia Britannica, with all its exhaustiveness, ignores it. The Standard in an obscure paragraph allows it a dozen words, while the Century gives it but a brief definition. To the average layman, *spinning* is a process usually associated with textile manufacturing, and the term *metal spinning* conveys no definite idea of its real meaning. A trade which furnishes employment to hundreds of skilled mechanics and which is necessarily an adjunct to many metal working establishments is certainly entitled to a place in technical publications, and to a definition in up-to-date dictionaries.

Metal spinning is the process of shaping sheet metal over a revolving chuck or form by means of a hand-tool, and the operation is analogous to that primitive one of making articles of clay on the potters' wheel. The metal used need not be discs, as one dictionary states, because ovals are as easily spun as circles, and the finished articles are not always "cups" as they intimate, but cylinders, balls, vase shapes, and even oval pitchers of irregular dimensions are made in large quantities.

A great many articles are spun which could be made in drawing presses at a less cost per piece, provided the quantities used were large enough to warrant the cost of the necessary dies. However, the demand may be so limited that few can be sold, in which case it is much cheaper to spin them on a simple wooden chuck than to go to the expense of tools for the presses. There are, of course, difficult spinnings which, because of their shape, cannot be pressed out, and some are so large, as for instance steam fire engine domes, large kettles and reflectors, running up to 60 inches in diameter, that presses of sufficient capacity cannot be considered. In the manufacture of silverware, both plated and sterling, fine lamps, metal fancy goods, and elaborate chandeliers, many shapes are used, which of necessity must always be spun.

High brass and Britannia are the metals most largely consumed in spinning, but low brass, copper, sheet zinc, sheet tin, German silver, sheet steel, lead, aluminum, nickel, silver, gold, platinum, and various alloys can be spun with proper manipulation. A competent metal spinner must be a man of intelligence, and should compare favorably with a good machinist in a general way. He should be physically sound and of full weight and stature, as much of the work is arduous and requires strenuous muscular exertion. To become a good metal spinner he should serve three or four years as an apprentice, and he will have much to learn after he has served his time. Such a man can always command good wages and need not search long for a position. Of course, in this connection, a good workman is referred to and one competent to plan and make his own chucks, as well as produce difficult and varied work.

A good spinning lathe is a necessity. An ordinary speed lathe with a few changes in its attachment can be used; but for general work above the very smallest character, a properly designed spinning lathe built for the trade is always best, and, in the end, the most economical. It should be heavily built and correctly proportioned to withstand racking strains, as frequently, on large work the spinner is obliged to put his whole weight on the tool through which a powerful leverage is obtained. The swing of the lathe should, of course, depend on the size of the work desired. It is best, however, not to have a lathe clumsily large, but one too small is worse than useless. The "gap" lathe, designed with a movable bed so built as to permit of enlarging to take very large work when required, is a desirable tool. A good lathe should have taper or cone bearings, with take up attachments to compensate for wear, and it should be fitted with a running center on the tail stock, which is necessary in making small spinnings; but where a small hole in the shell is permissible we prefer to use a *peg*, which is a rod about ¼ inch in diameter or larger for heavy work, with a wooden knob on one end and a thread on the other, which thread screws into the center of the spindle on the head. This *peg* is slit through a small hole in the metal blank which is to be spun and passes through the chuck into the spindle, holding the blank in place until it is tooled down to the shape of the chuck. The speed of the lathe must depend on the work and metal, but 1,800 to 2,500 revolutions per minute on the fastest cone is usually about right.

The tools for brass spinning are made from tool steel ⅝ to ¾ inch in diameter, forged into *ball points, flat-ends,* and other shapes and lengths, and the length is usually 24 inches or thereabouts. These tools can be purchased ready for use, though we frequently make our own tools, and a well equipped journeyman spinner furnishes his own tools. The other tools necessary are chisels and gouges for turning chucks, also various cutting chisels for trimming and skimming the metals, which with a set of knurls and rolling tools for turning beads, practically complete the kit.

A muffle or furnace for annealing shells in process is a necessary part of the shop equipment, and its kind and the fuel used will depend upon circumstances. A gas muffle is probably the best thing to be had, though an ordinary blacksmith's forge burning charcoal or good bituminous coal will answer nicely. An anvil or a substitute, on which to hammer shells before annealing, will be required.

A square shear for cutting brass from the roll, and a circle cutting machine are almost indispensable too, though circles can be obtained from the mills cut to any size desired. With the above equipment, the skilled workman is ready to commence work, which in ordinary course must be the preparation of the spinning chuck over which the shell is to be formed. For drafting-chucks and for spinning not requiring great accuracy, well seasoned wood is used, but brass, cast iron or steel, are much to be preferred when quantities are to be made, or exactness in size is desirable. Wooden chucks shrink somewhat and wear down under pressure of the tool, though a wooden chuck may be cased or covered with sheet brass, which preserves it and helps to retain the original size. Maple, apple wood, mahogany, lignum-vitæ, and similar fine grained woods are generally used.

In Fig. 1 is shown the evolution of a brass spinning used in gas or electric fixture work. It is about 6 inches deep and 1 inch in diameter at the small end. It is not of the most difficult character, but represents, well a good class of work in this line. It is made from No. 24 B. & S. gauge high-brass. Similar work is frequently made from low brass, which is softer and more homogeneous, and is especially desirable when the shell has to be silver plated, as the high brass is frequently porous. To make this shell a circular blank is used whose diameter has been determined by experience to be 6¾ inches. The blank is held against the chuck, either by the *peg* before referred to, or by the running back center, and is forced

down to the outline of the first drafting-chuck, which results in a rough shell as shown in No. 1. A ball pointed tool is used to produce this result, and the brass is lubricated with either common laundry soap or lard oil. Vigorous tooling has by the time the shell reaches this stage produced strains of compression in the metal, due to the atoms of which the metal is composed being forced from their natural relative positions, and it is now necessary to anneal the shell before beginning the next operation.

No. 5. No. 4. No. 3. No. 2. No. 1.

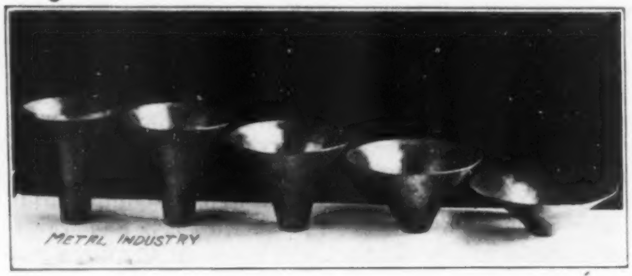


FIG. 1.

According to one theory of days long ago, annealing was necessary to soften the metal in order to allow the displaced atoms to flow back into their normal positions, but Dr. Black in the eighteenth century claimed that metals had a latent heat which, in process of working, was thrown off and must needs be restored by reheating or annealing; the first hypothesis is probably correct, but in view of recent discoveries in the field of atomic research, these theories may be entirely revised in the near future.

Before annealing, however, the shell must be hammered on the point of the anvil with a mallet in order to prevent fire-cracking. While this is usually done by hand, I have seen this work performed on a specially contrived power hammering machine, arranged somewhat on the lines of an old style trip hammer, and on a small scale. After annealing it is placed on the second drafting-chuck and forced down to the shape shown in No. 2 (Fig. 1), and the operations of hammering, annealing and drafting are repeated, as indicated in the illustrations until the shell appears as in No. 4 (Fig. 1), when after annealing the scale is dipped off in an acid bath, and the shell is ready to be completed as shown in No. 5 (Fig. 1) This final operation consists of spinning to its final shape and skimming off with a cutting tool, bringing the metal down to a smooth, clean surface.

Urn-shaped shells like that shown in Fig. 2 are made on a sectional chuck. This represents, perhaps, the refinement of good spinning, and the chuck consists of a tapered core over which is fitted a wooden form the shape of the finished shell. This form is then carefully sawed into sections, the cuts being parallel with its axis, one section, however, the key, being so cut as to fall towards the center. After the shell is spun down over this chuck the shell and the outer portion of the chuck are removed from the core when the section can be readily taken from the inside of the shell. Of course, a shell of this type has to go through the preliminary drafting operation as described in the case of No. 5.

Sometimes shapes of this nature have been made over soft metal chucks which were afterwards melted out of the shell, and they can be spun "free-hand" without the aid of a fully shaped chuck. The twentieth century method of doing similar work when quantities are required is by means of "bulging" or "necking" attachments. A shaping roll for the inside of the shell is used in conjunction with a movable finishing roll attached to the tool rest. Of course, many plain shells of small diameter and depth are spun with one operation on a simple wooden chuck, and when large numbers are made of certain forms as for instance brass bedstead trimmings. The first operations are performed on presses, and the final shaping and finishing on spinning lathes.

Copper requires about the same treatment as brass. It does not skim or finish quite as readily as brass, and because of the poisonous oxide which flies off after annealing it is not looked upon with favor by the average workman. The percentage of loss through defective metals is quite as great as with brass, and in making a shell similar to that shown in Fig. 2, a liberal amount must be added to the cost to cover losses in working. This shell (Fig. 2), represents an excellent piece of workmanship.

Aluminum, either pure and soft or alloyed to almost any degree can be spun easily. There are always some losses through flaws in the metal, but on the whole, it is a very satisfactory metal to handle. It is very susceptible to denting in finishing, but a great deal of this trouble can be avoided by having the metal alloyed. The mill people are very willing to assist in overcoming difficulties of this kind. Care should be taken in annealing not to get the metal too hot. The sheet should be brought to an even temperature, and to such a degree as will char the point of a pine stick sufficient to leave a black mark on the surface of the metal. It is frequently annealed in hot sawdust.

Sheet zinc spinnings have been used in considerable quantities, and for some purposes will always be in demand. There is usually a considerable percentage of loss, and the operation of annealing is troublesome. The usual method is to apply a coating of oil to one side of the sheet, with a piece of waste, heating the other side until the oil burns. The blank is then immediately placed on the chuck and spun down while warm. Another method, and one which I understand is practiced in Germany, and perhaps elsewhere, is to heat with gas the metal chuck or the blank itself, while revolving on the lathe.

Steel spinning, while it may not interest the readers of this journal, seems to come within the scope of this article, and there seems to be a growing demand for steel

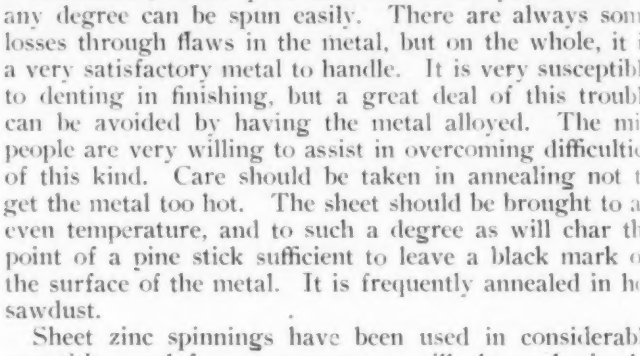


FIG. 2.

shells. Stiffness, lightness, and small cost are its chief recommendation. A constant improvement in quality is being made by mills making a specialty of this grade. Well known mills of the Steel Trust who advertise loudly the high quality of their stock, particularly for drawing and spinning purposes send out material which varies from bad to good, depending on how busy they may be at the time. Good steel, however, can be spun into any plain shape not too deep, and we produce work from 18 to 30 guage in thickenss. Soap is a very good lubricant, and deep work should be annealed.

The demand for pure nickel and platinum spinnings is light. They are mostly used in connection with scientific laboratory work and in chemical determinations of late nickel is displacing platinum to some extent for these purposes, because while it does not last as long, its much smaller first cost makes it cheaper in the end.

Oval spinnings are made on an ordinary lathe with an oval or eccentric attachment on the headstock.

Metal spinning is a trade directly involving hand work, and it can never be superseded by machinery. Some of the work produced is little short of wonderful, and this interesting trade will always furnish employment to many skilled workmen.

PICKLE STAINS.

The presence of pickle stains on brass goods often causes much trouble, and our knowledge of them is not as complete as it should be for the thorough understanding of the causes which produce them. Some time ago, Professor Turner, of Birmingham, England, that great brass city, was called upon to investigate the cause of pickle stains. It has been customary to attribute such stains to sulphur, furnace dust, or similar conditions, and it is often believed that such stains pass through the whole mass. Professor Turner says that such a belief is entirely erroneous as the stains are entirely superficial and do not pass beyond the surface. No nodules were observed. He experimented by evaporating water, salt water, pickle, and dilute acids on the surface, and also by writing with the same materials. He obtained stains, with chlorides, but not with zinc chloride. His conclusion was that the chlorides attack the zinc and liberate the copper, but zinc chloride formed during the pickling cannot do this. The pickle stains, he concludes were formed by allowing the water to dry on the surface after the completing of the pickling operation.

The brasses themselves were found very uniform. He remarks that as the water of Birmingham is notably impregnated with chlorides, this fact accounts for the excess of such trouble in the locality.

BRASS AND COPPER IMPORTS IN RUSSIA.

Russia is a large country and its consumption of manufactured metals is constantly increasing. The importation of copper into this country seems to be altogether monopolized by Germans, owing, it is said, chiefly to the facility with which they discount Russian bills and drafts at sight. Considering the large consumption of copper in Germany far exceeding that of Great Britain, it is very interesting to mark the growing extent of Germany's exportation of this metal. The conclusion to be drawn is that a central market of such an important metal as copper is being established in Germany.

The importations of brass into Russia is somewhat limited, and the native producer appears to be able to satisfy the demand. There is a single brass sheet rolling mill in Russia at Moscow, which takes care of the sheet trade.

Lead is chiefly imported from Germany and antimony, of which large quantities are used in the manufacture of stereotype and similar printing trade alloys, comes from Austria.

It is reported that a Buffalo man, Stephen T. Lockwood is about to begin the manufacture of radium in that city. If carried out, this will be the first establishment of the kind in the United States. The ore, pitchblende, from which radium is made is to be obtained from Colorado.

THE USE OF SALT IN MELTING BRASS.

By Erwin S. Sperry.

Copper is one of the most difficult metals to melt. It oxidizes very rapidly and the oxide is absorbed by the metal. This dissolving action is not readily apparent to the naked eye but it can be easily appreciated when the melting of copper is compared to that of lead or tin whose oxides are not absorbed but rise to the top and may be readily skimmed off. In melting copper it is this property of dissolving its own oxide that renders the manufacture of copper alloys so difficult to carry out in an uniform manner. The amount of oxide which is absorbed may be greater in one case than in the other and hence the quality of the resulting alloy is worse in the one instance than in the other.

Various means are taken to prevent this formation of the oxide and charcoal is used in the refining of copper as an excellent material for the purpose. The charcoal, of course, reduces the oxide to metal but, at the same time, a pole of green wood is employed in connection with it to stir up the mass and were it not for the combination of the two agents, it is probable that the copper could not be entirely brought up to pitch. This same method, naturally, has been tried in the brass industry, but it does not work well as the necessity for total elimination of the oxide is much greater than in the copper refining process. The use of the green wood stick, therefore, has not remained one of the accessories of the brass industry but, however, some one occasionally declares that its use renders the quality of brass far superior to that made without its use.

If copper could be melted without any oxidation, the brass which results from it would be perfect in quality; assuming, of course, that the copper and spelter were free from foreign elements. This method of melting has never been carried out, and even were it possible, the small amount of oxide which is invariably present in the copper ingot itself would render the presence of oxide unavoidable. Some agency which would remove the oxide of copper after the copper had been melted would be a distinct advantage in the production of good metal and this material is found in *Common Salt.* I do not mean by this that no covering is necessary when copper is melted for the purpose of making brass; in fact, I believe that it is impossible to obtain a good alloy unless such a procedure is carried out. In spite of the utmost care being used, however, in the use of charcoal a small amount of oxide of copper is sure to be formed in melting and renders the brass dirty and apt to crack. It also causes the metal to be "spilly!" The proper method of procedure, then, in making good brass is to use both charcoal and salt and this has actually become standard practice in the brass industry.

It would at first appear that salt simply acts as a covering like any flux would do when melted on the metal. Borax, glass, fluorspar, and soda ash are all examples of such fluxes but, while they actually protect the metal from the influence of the air and gases of the fire, they act no further and after copper has once been saturated with oxide they do not, probably, remove it entirely and in many cases not at all. This at once brings up the question as to whether it is not better to prevent the formation of oxide rather than to attempt to reduce it after once formed. In order to answer this question it is necessary to state that, with the present methods of melting, it is impossible to prevent some oxide being formed during the melting process; if it were, then the use of salt would be entirely unnecessary. As it is, however, it is better to reduce what small amount does actually form as habit-

ual use of salt in brass-making has demonstrated that, without it, the most satisfactory results cannot be obtained.

The use of salt, simple operation that it is, has effects far more reaching than the agency of a simple covering. In fact, it is the part of the salt to actually reduce whatever oxide is formed and leave nothing but pure copper. Although I cannot say how far back the use of salt in brass melting dates, I do know that it is quite old, but for some time has been kept as one of the trade secrets of the brass industry and there are mills to-day who are ignorant of its use, but I regret to say, the quality of their brass suffers. As far back as the year 1882, the effect of a flux of common salt on copper was noticed and R. Monger* experimented with its use. His results were so flattering that he actually proposed the method for making an assay of copper. He tried the effect on various grades of copper. His method was as follows: Salt was melted in a clay crucible in a quality sufficient to cover the copper afterward added and when at a good red heat the copper was dropped in and allowed to remain in a melted condition for at least ten minutes. The button of copper after cooling was then removed and weighed. The loss indicated the oxygen in the copper. Some of his results are given below. The copper upon which he experimented was, of course, English brands, although the "Tough Pitch Barilla" is similar to our Electrolytic or Lake; the quality, however, was probably much inferior to our highly refined copper of either kind now obtained on the market. The results obtained by the use of salt, however, are fully as well shown as if he had used our present grades of copper. His experiments are as follows, viz.:

1. Tough Pitch Barilla Copper melted under salt in clay crucible lost 0.47 per cent. of its weight = 0.05 per cent. of oxygen = 1.06 per cent. of suboxide of copper.

2. Best Selected Copper melted in the same manner as No. 1, lost 1.125 per cent. of its weight = 0.125 per cent. of oxygen = 0.44 per cent. of suboxide of copper.

3. Very Dry Pitch Copper melted under salt in the same manner lost 4.4 per cent. of its weight = 0.44 per cent. of oxygen = 12.79 per cent. of suboxide of copper.

4. The two buttons resulting from No. 1 and No. 2 were melted under salt in the same manner and lost nothing.

These experiments are very instructive and prove that salt actually reduces the oxide of copper to the metallic state.

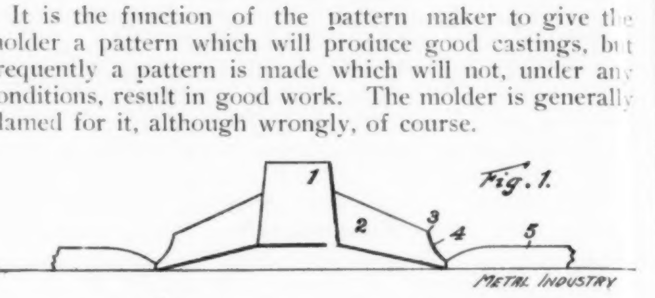
The method of using the salt in brass-making is quite simple for there is no stated quantity and the amount which is used should only be limited by the fact that a large quantity is apt to form a liquid slag which is difficult to skim off. Further than this there is no need of scanting the use, as salt is not expensive, and if too little is used the quality of the brass suffers. My experience has been that the best results are obtained when the amount of salt which is used is such that a slightly viscous mass may be felt with the skimmer when the pot is skimmed but not enough to become liquid when the pot is poured. The copper in the crucible should be well covered with charcoal and when it begins to melt several handfuls of salt may be added. After all is liquid and before speltering more salt should be added.

Strange to say, the salt does not appear to act on the crucible appreciably and this is a feature which renders its use all the more valuable. Other fluxes which form very liquid slags, attack the pot to a large extent. Salt, therefore, forms one of the necessary adjuncts of the art of brass making, and it may be said that the greater part of the brass industries are using it. One establishment that has an excellent reputation for good brass, buys a car load at a time.

*Chemical News, London, 1882.

GATING PATTERNS.

It is the function of the pattern maker to give the molder a pattern which will produce good castings, but frequently a pattern is made which will not, under any conditions, result in good work. The molder is generally blamed for it, although wrongly, of course.



A new form of runner is now being used which has many excellent features. It has been brought out by F. H. Arnold, of Reading, Pa. The gate or runner is shown in Figs. 1 and 2. In Fig. 1 is shown the end view. By referring to this it will be seen that the true pattern is indicated as 5, and that a number of small feeders enter

from the main runner. The runner is made with a slightly downward slope, and the smaller feeders are also made in this shape. These feeders are contracted at 3 and 4, or just before they enter the pattern proper. A slight offset is given the feeders, so that the metal runs down into the pattern from the runner.

This method of slightly "choking" the metal before it enters the pattern serves to retain all dross and dirt which invariably enter the runner when the metal is poured. Sand holes and dross spots are, therefore, avoided. It will be noticed that there is no attempt to thin the gate, as is often done, but the thickness is left up to the very pattern, so that there is no tendency for the metal to chill before it reaches its proper place. This method of pattern making is a step in the right direction, as sooner or later there will be standard methods of pattern making, as there are speeds and feeds in metal cutting or working.*

For use on wood patterns no varnish equal to shellac has yet been discovered. The sand adheres to other varnishes, but a well shellaced pattern leaves the sand as clean as when it entered. Much of the ready made commercial shellac is adulterated with rosin or similar cheap gums so that the pattern maker should, if the best results are desired, make his own shellac from flake shellac and alcohol. Wood alcohol, if good, works equally as well as the grain alcohol, but we have seen some impure wood alcohols give more or less trouble.

A NEW METHOD OF NICKEL PLATING.

A new method of nickel plating has recently been patented by Thomas A. Edison, which combines electroplating with that of the old fire method. He says: "Its object is to produce an adherent coating of metallic nickel on iron or steel by electrolytic decomposition. The process may be carried out in connection with sheets and blanks which are subsequently drawn, pressed or stamped into desired shapes, and it can also be carried out for the nickel plating of iron or steel articles having their ultimate shape."

In carrying out his invention, the iron or steel is first given a thin coating of nickel in the ordinary nickel plating bath. The sheets are then piled or nested together, so as to occupy as small a space as possible, and then placed in a cast-iron chamber or clay retort, which is closely sealed. A non-oxidizing atmosphere is then created in the chamber, preferably by passing hydrogen gas through the same to displace the air. The sheets are then subjected to a temperature sufficient to weld the nickel to the steel or iron backing. The non-oxidizing gas is continually passed through while the operation is going on, and the sheets are cooled below the oxidizing point while the gas is passing. The sheets are then removed and a fresh charge inserted. He says: "I find in practice that the sheets or articles should be heated to a bright yellow, at which point the nickel welds to the iron or steel, so that it becomes integral with it, and at the same time the surface of the nickel becomes very bright." Mr. Edison finds that the nickel plated sheets so produced can be formed into any of the shapes that are practiced upon iron and steel without any sign of the nickel peeling or cracking. Although there is but a film this plating gives a lasting and durable coating. He states that he finds that, no matter how carefully sheets of iron or steel are electroplated with nickel, any attempt to draw or stamp the articles invariably results in the peeling or cracking of the nickel coating. He explains such a phenomenon by saying: "Owing to the condition of tension of the nickel plating, which condition is relieved by the welding process described. The welding process also serves to anneal the sheets for the first operation in drawing."

Mr. Edison says that so perfect is the result secured that by this process cans, dishes and other similar stamped, drawn or spun work may be made, and goods heretofore made of tin plate may be replaced by this nickel-plated iron or steel. He also says that articles made from this nickeled iron or steel may be made much cheaper than even those of tinned plate, on account of the difference in thickness between the tin coating and that of the nickel. The tin plate is, of course, produced by dipping the iron or steel sheet in molten tin, while the nickeled sheets are produced by the electro-plating process. The thickness of the latter, therefore, may be readily controled.

Nickel-plated iron sheets have been long on the market as a German production, the product of the nickel works of Theodore Fleitmann, of Iserlohn, Prussia, but according to the patent allowed Mr. Fleitmann are made by welding sheets of iron and nickel together by means of a flux and in the same manner that iron is welded. The sheets are then hot-rolled to the required thickness. Mr. Edison's process, accordingly, differs radically from that of Fleitmann's.

Magnesium is a much lighter metal than aluminum. Aluminum has a specific gravity of 2.58, while that of magnesium is only 1.75. It will be seen, therefore, that aluminum is half again as heavy as magnesium.

DIPPING ZINC.

By F. P. Davis.

Contrary to the general opinion zinc may be successfully dipped to a bright finish in a mixture of equal parts of nitric acid (aqua fortis) and sulphuric acid (oil of vitriol), to which an amount of common salt equal to about one per cent. of the solution has been added. The heat, which is produced by mixing the acids, should be allowed to disappear, and the solution become cold before using.

The work to be dipped must be thoroughly cleaned from oil or grease. Plunge the work into the dip a few seconds until the acid bites freely and equally, then remove and rinse in water. If for any reason the work requires re-dipping, it must be dried before putting into the acid. This is very essential, for if the mixture is contaminated with water it will act violently on the zinc, and probably boil over. The zinc will then become blackened, and the surface pitted.

If the dip becomes heated by continuous use, work should cease until the solution can be cooled down to the proper temperature. Small zinc articles may be dipped in a basket if the above directions are carefully followed. Where an extra fine finish is required, the sand buffing process should be used. Zinc is a very hard metal for one that melts at a low temperature, and the surface of rolled zinc is much harder than the metal underneath. In "cutting down" with a heavy cloth buff the surface will become hot enough to start, causing a cloudy and slightly pitted appearance. The process of sand-buffing causes less heat, and by finishing on a soft coloring wheel a very fine surface may be obtained.

In cleaning zinc articles for the plating bath, it is not advisable to immerse them in the hot caustic potash solution, as is customary with brass. The galvanic action will be sufficient to destroy the polish of finely finished work. The work should be freed from grease and oil by washing in benzine and drying in sawdust. Then lay the work on a board across the top of the potash kettle and wash quickly with a cotton swab or brush, being careful to reach every part of the surface; mere wetting is not sufficient. When done plunge the article quickly into the potash and out again immediately, rinse with water, pass through the cyanide dip, and place at once in the plating bath.

Bertha zinc, one of the purest of the American brands of spelter, possesses, according to recent analyses, the following average composition:

	Per cent.
Metallic zinc	99.952
Iron	0.012
Lead	0.036
Cadmium	None

COPPER-PLATED PLASTER CASTS.

New uses are constantly being found for electroplating, and one of the latest is the use in taxidermy in making casts of fishes, reptiles, birds and animals. The Smithsonian taxidermists were among the first to adopt this new method. It has been the experience in sending about plaster and papier maché casts of animals to various exhibitions that they are subject to much damage in packing and shipping. Instead of fragile objects of this kind, therefore, persons who visit the St. Louis Exposition will see animals of hollow copper or brass, so lifelike, however, that many will think the real thing is before them.

SELF-LIGHTING GAS BURNERS.

There has recently come upon the market a form of self-lighting gas burner which, while really novel, combines the physical property of one metal and the chemical property of another for its features. Both of these properties are very old, but this does not, of course, preclude the fact that credit is due the person who has made the application.

The burner consists of a corrugated strip of metal attached to the burner tip, at the end of which is a small wad or pellet. The igniter is allowed to remain on the burner permanently, and to light the gas jet nothing else is required but to turn on the gas. When it comes in contact with the wad or pellet at the end of the corrugated metal strip, the gas is immediately ignited. The idea of the metal strip is to remove the wad or pellet from being constantly in the flame, and the performance of this feature is a very pretty example of the expansion and contraction of metals. Before the gas is lighted the metal

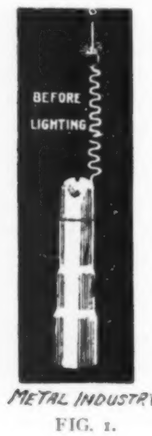


FIG. 1.

FIG. 2.

takes the position shown in Fig. 1, but after it becomes heated by the flame bends itself over in the shape indicated in Fig. 2. After the light is extinguished the strip immediately returns to the vertical position.

The wad or pellet, however, is the essential part of the appliance, and consists of asbestos or clay upon which platinum has been deposited in a finely divided condition, or in the form of platinum sponge as it is called. The fact that finely divided platinum possesses the property of igniting gases was discovered by Dobereiner in 1823, and it is to this principle that the working of the appliance is due. Although the principle is quite old, the application has been the subject of many patents and inventions. The function of the asbestos or clay is to act as a holder for the platinum and expose as much surface to the action of the gas as possible.

Palladium, a metal resembling platinum, but more expensive, possesses the property of igniting gases in a very much more marked degree than platinum, and would be quite useful for the purpose, were it not for the fact that it is fusible in the gas flame, while platinum is not, and if used alone would fuse into a solid mass which would not ignite the gas. To avoid this difficulty, and, at the same time gain the maximum efficiency, an English inventor proposed as far back as 1884 to use a mixture of three parts platinum sponge, and one part of palladium sponge, which would give the required infusibility. Although asbestos and clay are used for holding the sponge, it is said that meerschaum, upon which has been deposited the platinum in a finely divided condition, offers many advantages for this purpose.

BRAZING CAST IRON.

Cast iron may now be successfully brazed by the Pich process, and it is said, the joint is actually stronger than the solid metal. The difficulty heretofore experienced in brazing or soldering cast iron has been on account of the carbon or graphite which is always present in the metal. Nothing will adhere to this. By the Pich process this carbon is burned out by means of oxide of copper, which itself is reduced at the same time to metallic copper. This oxide of copper is applied in the form of paste and, after the carbon has been burned out, a coating of copper is left on the iron. The brazing process does not then differ materially from the usual method with borax and brazing solder. The process, then, is essentially one of removing the carbon from the surface to be brazed.

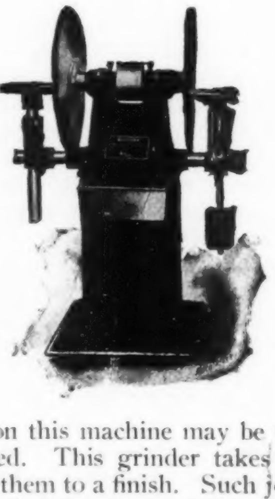
Only Ceylon graphite can be used in the manufacture of crucibles, other kinds do not give the crucible the proper lasting and resisting qualities. The amount of graphite imported into the United States from the island of Ceylon amounted to $1,031,289 in 1891.

Artificial graphite made by means of the electric furnace, while answering perfectly for some uses, does not make as good a crucible as the Ceylon material. This is probably due to the absence of that fibrous quality only found in Ceylon graphite.

DISC GRINDERS.

It is surprising what may be done on a disc grinder. This tool bears much the same relation to flat surfaces that the universal grinder does to cylindrical surfaces.

A disc grinder is simply a grinder having steel discs instead of the usual emery wheel. These discs are covered with emery cloth, and there is produced a wheel which may be run at a high speed without danger of bursting, and has the hard steel backing to prevent being cut out, as an emery wheel will do, by the pressure of the work. There are several makes of this disc grinder on the market, but one of the best is that made by the Bayldon Machine Company, 20 Morris street, Jersey City,



N. J. The disc on this machine may be run at twice an emery wheel speed. This grinder takes castings in the rough and brings them to a finish. Such jobs as the hexes on valves, nuts, scale beams, etc., are just the kind of work on which this machine excels.

One feature of this machine is the balanced rest, which greatly aids the work. The use of the disc grinder will surprise you in the quality of the work turned out. Much work heretofore machined may, with very much less time, be brought to an equally good finish. The disc grinder is certainly a step in the right direction, and those shops which desire to reduce costs should investigate its merits.

MANUFACTURE OF TINFOIL AND BOTTLE CAPS.

TINFOIL.—The size or fineness of tinfoil is expressed by the number of square inches covered by one pound of foil. The three principal varieties of tinfoil are pure tinfoil, composition foil, and German foil.

The pure tinfoil contains tin exclusively, while composition foil contains a core of lead in the middle covered on both sides by a thin coat of tin. To recognize those two foils, a drop of nitric acid is put upon the sample examined. If pure tin, metastannic acid is formed instantaneously, and a white spot appears; if composition, the coat of tin is also attacked, but the layer of metastannic acid is so thin that the lead will show through it, thus presenting a black spot.

For the making of pure tinfoil the tin is first melted in cast-iron pots, and cast into slabs of about 19 by 13 and 1 inch thick. These slabs are cooled and then passed through the breaker. The breaker is a large rolling mill of the ordinary pattern. By successive passages and reducing each time the space between the rolls, the slab of tin is transformed into a sheet having little more than the original width, a thickness of about 1-16 inch, and a length of about 25 feet. This sheet tin is wound tightly upon a spool which is then brought to the roller mill.

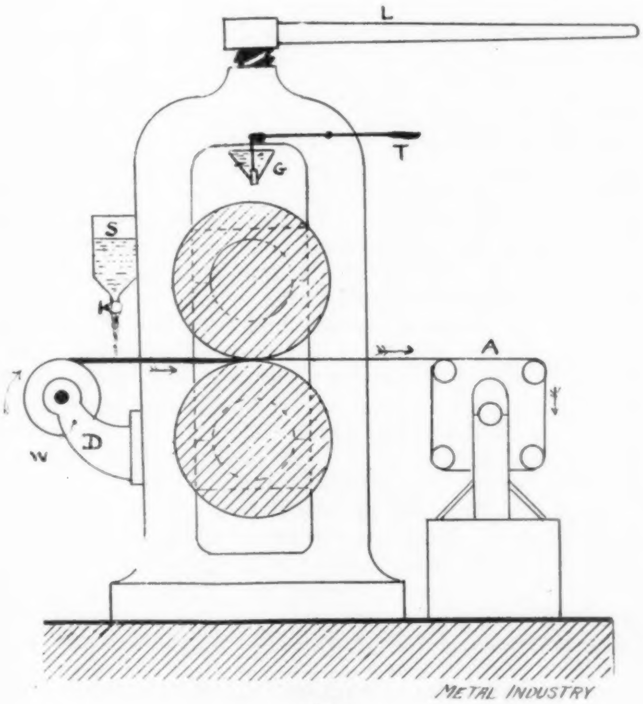


FIG. 1.

C is the spool supported by bracket D. S is a tank containing soapsuds which flow on the sheet of tin and prevent its sticking to the rolls. A is the reel on which the foil is wound as it comes out of the rolls. The pressure between the rolls is regulated by a lever L, which the workman can handle with one arm, while he winds the foil with the other.

While the pressure between the rolls is one of the elements which determine the thickness of the foil, no very thin foil could be produced unless another element were added, which is a high tension of the sheet between the spool and the rolls. In order to obtain it a screw W presses on the brass rim of the spool, and while the rolls draw the tin, the resistance created by the screw holds it back. A reluctance, so to speak, of the tin to go through the rolls is thus created, and the thinness of the foil is increased. A third element also comes into play, which is the heat developed by the high friction of the bearings. Under its influence, the parts of the rolls which are nearer to the bearings become hotter than the middle parts, and consequently expand more. If the rolls were perfectly flat, they would tend to become concave, the pressure between them would be less in the middle than on the ends, and a fail wavy and undulated on the edges would be produced. In order to avoid this defect, the rolls are ground slightly convex, so that when they have taken their normal expansion they will be perfectly flat, and the pressure even all along the line of contact.

In order to control still better such evenness of pressure, a gutter, G, filled with cold soapsuds is suspended above the rolls, which are manoeuvered by touches, T, each valve having its touch so that the whole resembles a piano keyboard. If a line of waviness is noticed at any time in the foil coming out of the rolls, the workman plays on one of several touches above that line, the valves are opened, cold water trickles over the part of the rolls which was too hot, cools it, and smoothness is restored.

For the making of composition foil, an ingot of lead is first broken to a thickness of about ½ inch, and a length of 3 feet. It is then sandwiched between two sheets of tin about ⅛ inch thick, when the whole is passed through the rolls of the breaker at high pressure. The three sheets are thereby welded into one, the lead being in the middle and the tin on both faces. This composite sheet is then passed through the breaker, wound on spools, and rolled as with pure tin foil.

Foils of pure tin can be rolled up to 10,000 square inches per pound, and composition to 7,000, but with German foil as high as 14,000 can be reached. This German foil is made of tin alloyed with a few per cent. of foreign metals. The composition of the metal is supposed to be a secret. This foil is readily recognized by its special thinness, which equals that of tissue paper, and by its appearance, being bright on one side and dull on the other. The ingots of metal for German foil are first broken, and the resulting sheet tightly wound upon the spools. Then two spools are set together behind the rolling mill, and the two sheets are passed at once through the rolls. Two sheets of pure tin would weld under those circumstances, but the composition of the metal is such that it will not weld. To further prevent welding, soapsuds are injected between the two sheets of metal as they enter the rolls. As two sheets are fed to the mill, two foils come out of it, and as 7,000 can be obtained for a single foil, 14,000 can be reached with 2. The faces of the foils which were in contact with the rolls are bright, while the internal faces are dull.

Those different qualities of tin foil as they come from the rolling mill only to be folded, piled up, pressed, and cut to the desired size, to be made into a salable article. However, further work may be demanded, for instance, painting, corrugating, and printing. For the painting, the foil is wound on a drum and passed on a long table of wooden rollers, provided with steam pipes, which promote quick drying of the painted foil. Varnish of the desired shade dissolved in fusel oil is caused to flow on the foil at the head of the table, and is spread evenly by a rubber scraper. The foil then progresses slowly to the other end of the table, which it reaches in a dry condition, the fusel oil having all evaporated, and it is wound on a second drum. If corrugating is desired, the corrugating machine is interposed between the drum B and the drying table.

The corrugating machine is composed essentially of two rollers, one made of steel, and engraved, and the other made of compressed paper. Smooth foil passed between two rollers will come out corrugated. Finally the foil may be printed, which is done by passing in the last resort through a printing press as if it were paper.

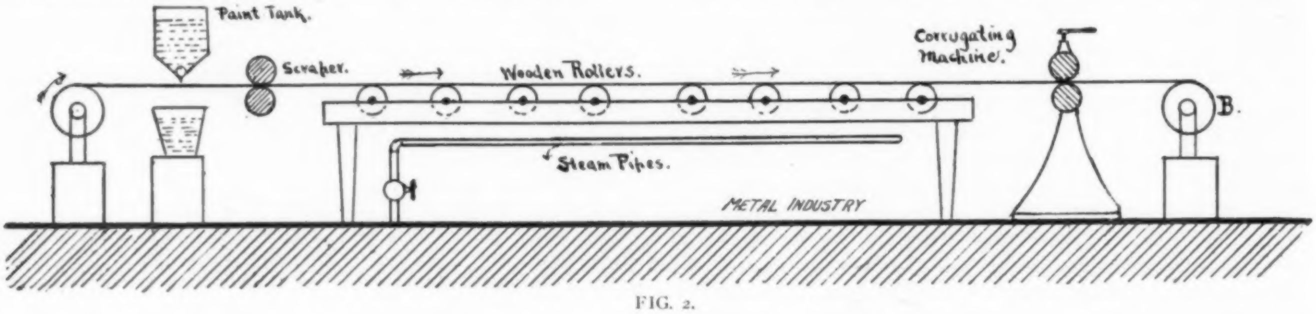


FIG. 2.

BOTTLE CAPS.—For the manufacture of bottle caps, a composite sheet is first rolled having a core of lead, and on each face a coat of tin hardened by 1 per cent. of antimony. From 3 to 6 of these sheets are passed through a punching and stamping machine. The bunches of caps thus produced are then passed in a series of stamping machines, the shape of dies and matrices being such that the sides of the caps are drawn more and more, while the heads of the caps remain nearly unchanged.

Under the pressure and friction the caps would weld into one, but the 1 per cent. antimony is sufficient for preventing such occurrence. The bunches of caps having thus acquired their shape, they are taken in hand by girls, who pick the caps apart, tedious and delicate work. The caps are then polished on a small lathe with an ivory tool, dressed and cut, painted, and stamped if desired.—Rafael Granja, Soc. Chem. Ind.

THE UNITED LEAD COMPANY.

The organization of the United Lead Company has recently been completed with offices at 71 Broadway, New York City. The company has taken over the following lead concerns: James Robertson Lead Company, Baltimore, Md.; Omaha Shot and Lead Works, Omaha, Neb.; Northwestern Shot and Lead Works, St. Paul, Minn.; Collier Shot Tower Works, St. Louis, Mo.; Bailey and Farrell Shot Works, Pittsburgh, Pa.; Markle Lead Works, St. Louis, Mo.; Gibson and Price, Cleveland, O.; Le Roy Shot and Lead Works, New York City; Union Lead and Oil Works, Brooklyn, N. Y.; Sportsman's Shot Works, Cincinnati, Ohio; Chicago Shot Tower Company, Chicago, Ill.; Hoyt Metal Company, St. Louis, Mo.; Tatham & Bros., New York City; Raymond Lead Company, Chicago, Ill.; E. W. Blatchford Company, Chicago, Ill.; Chadwick-Boston Lead Company, Boston, Mass.; Lausten Lead Works, Chicago, Ill.; McDougall White Lead Company, Buffalo, N. Y., and Thos. W. Sparks, Philadelphia.

The New York, New Haven & Hartford Railroad Company have again placed an order for copper sheathed pasenger cars. Within the last week an order was placed with the Wason Manufacturing Company, of Springfield, Mass., for 100 such cars. The copper sheathed car has apparently passed the experimental stage and become a recognized type. The employment of this type of car in the New York subway will effectually prevent the disaster which recently took place in Paris, and relieve the fear which has existed in the minds of prospective passengers.

CONVENTION OF THE ALUMINUM ASSOCIATION.

The third annual convention of the American Aluminum Association was held at the Murray Hill Hotel, New York, September 4 and 5, and proved to be a very enjoyable affair. There was as large an attendance as at the Pittsburg meeting of 1902, and several new members were present. The business part of the convention was taken up by reports of the various committees, and a discussion of the aluminum industry as the manufacturers find it to-day. The chairmen of the committees reported progress, saying there was a better understanding among the manufacturers; the competition was less keen and some of the firms had adjusted their price lists so that they corresponded. A question which caused considerable comment was the attitude of the present producers of the metal—the Pittsburg Reduction Company—toward the manufacturers, as it was cited that the Pittsburg Company have their own plant for manufacturing aluminum goods. None of the manufacturers said they had suffered to any extent from this competition, as they recognized that it was a means of advertising aluminum goods more extensively, still they wished to know the position of the company. To this the representatives of the company replied that their policy in making whatever goods they did was one of encouragement and to increase the sale of aluminum in all forms.

When the business session had ended on Friday the members in the afternoon and evening were the guests of the Pittsburg Reduction Company, who took all, including the wives of some of the members, on a parlor trolley car to Manhattan Beach, where dinner was served. In the evening the party was entertained at the far-famed resort of Coney Island—Luna Park.

All of the officers of the association were re-elected for another year. They are: Joseph A. Steinmetz, president; W. H. Wagner, vice-president; Matthew Griswold, second vice-president; Palmer H. Langdon, secretary-treasurer. St. Louis, Mo., was selected as the city for holding the convention of 1904.

CANADA BRASS ROLLING MILLS, LIMITED.

The name of the new brass rolling mill which is being built at Toronto, Canada, has been changed from the Canada Metal Milling Company to the Canada Brass-Rolling Mills, Limited. The mill is well under way, and the management informs us that they expect to begin operations about January 1, 1904. Only brass sheet will be rolled at first, but later the manufacture of brazed and seamless tubing will be undertaken, as well as the manufacture of wire. Other branches will eventually be added.

The rolls and other equipment were built by the Waterbury Farrel Foundry, and is being installed under the superintendence of Mr. Ferdinand Deming, well known in the Naugatuck Valley as a man of long experience in the brass industry. With this equipment and guidance the mill will become a strong factor in the brass business and wrest the Canadian trade from the brass mills of the United States, as Canada has long been the stamping ground of our brass salesmen.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—We have been asked whether a good grade of babbitt metal can be made with zinc as the base. Also the formula for a No. 1 babbitt metal, such as commonly sold on the market.

A.—There are several kinds of anti-friction metals sold which either contain zinc as the principal ingredient, or as a large constituent. Such alloys are known as the "white brasses." They are largely used for marine work, where the journal box in which they are used is very large and bulky. These zinc alloys, while possessing excellent anti-friction qualities and apparently fully the equal in this respect of babbitt metal made after the genuine formula, are difficult materials to cast. When melted they make much dross and run thick and sluggish. For this reason their use in ordinary machine work is not recommended. In marine work, where the bearing is large, the alloys will run, but in such places as the lining of shafts or other similar work, the thinness of the shell prevents the proper filling when the alloy is poured. If heated sufficiently to "run" the box, there will be so much dross formed that the result will be very unsatisfactory.

The formulas as usually made are as follows, viz:

	Tin. Per Cent.	Zinc. Per Cent.	Antimony. Per Cent.
Parson's white brass	60.00	38.00	2.00
Fenton's metal	20.00	80.00	...

Alloys high in zinc, like Fenton's Metal, often require melting in a crucible, as the pouring temperature is necessarily high.

Babbitt metal as now sold on the market and that known as No. 1 consists of the following, viz.:

	Per cent.
Tin	88.00
Antimony	8.00
Copper	4.00

Q.—Correspondent desires a method for producing the Verde Antique finish on brass.

A.—The method of producing this finish is as follows, viz.: Dissolve in 100 parts of acetic acid of moderate strength 30 parts of sal ammoniac and 10 parts each of common salt, cream of tartar and acetate of copper. If not sufficiently liquid add a little water. Mix well and smear the object with it and allow it to dry at the ordinary temperature for forty-eight hours. At the end of that time the article will be found to be covered with a green coating—the Verde Antique finish. As brass is not as readily susceptible to this finish as copper it is not superfluous to give the brass article (especially if yellow brass) a good electroplate with copper.

Q.—Correspondent wishes to know how to make castings of sterling silver in the same manner that brass is cast in sand.

A.—Sterling silver may be cast in sand in the same manner as brass, but the surface is invariably rough from the coarseness of the sand. To be sure, fine sand may be used, but there is a limit to this, and even with the use of the finest sand and drying and smoking the molds, the casting will be somewhat rough.

For casting sterling silver it is now customary to use plaster of paris molds, as these may be made so that the surface is as smooth as glass. Ordinary plaster of paris, however, will not stand the heat, but will crack and fly when the metal strikes it. For this reason it is customary to mix it with finely divided abbestos so as to render the mass tough. Fine, short fibre asbestos is mixed with water and ground until the mass is about the consistency of cream. Plaster of paris is mixed with water in the usual manner, and a final mixture made by taking about two parts of the plaster of paris mixture and one part of the asbestos mixture. After the molds have been made they are dried at a moderate heat of about 250 degrees for some time, or until the water has been driven off. The heat is then increased to about 1,000 degrees, or a red heat. This heat is retained for about two or three hours and the mold is ready for use.

Q.—A foreign brass rolling mill asks us for some information regarding the casting and rolling of phosphor bronze sheet. Such sheet they intend to use in the manufacture of pulp by the sulphite process, and have had trouble in making it. The composition which they have used is as follows, viz:

Copper, 93 per cent.; tin, 5 per cent.; 10 per cent. phosphor-copper, 2 per cent. This gives an alloy consisting of

Copper	94.8 per cent.
Tin	5.0 per cent.
Phosphorus	0.2 per cent.

This mixture, they say, cracks to pieces when rolled both cold or hot.

The difficulty in this mixture is in the phosphorus. It is, by far, too excessive. The amount of phosphorus in the mixtures intended for rolling should not be over .05 per cent. Its only function is to prevent the oxide of copper from forming, and this amount answers the purpose without giving the objectionable features of the excess. Use the following proportions of the ingredients, viz:

Copper	94.50 per cent (or pounds)
Tin	5.00 per cent (or pounds)
10 per ct. phosphor-copper	0.50 per cent. (or pounds)

This mixture must be rolled cold, and if a good quality of copper is used no trouble will be experienced.

Q.—Plater asks detailed information about making oxide of gold.

A.—Take a solution of chloride of gold in a porcelain dish and heat to boiling. Add magnesia until the solution is slightly milky from the excess of magnesia. Filter through a glass funnel in which is a thick filter paper and allow to drain out. Now fill funnel with water and allow to drain again. Repeat this several times and next add a dilute solution of nitric acid made by taking 1 part of nitric acid and 10 parts of water. Add this to the funnel until about half filled and when the solution has run through repeat. Now fill with water as before and allow to drain, and after repeating this again and drying the mass in the funnel, oxide of gold is produced. The carrying out of this process requires some knowledge of chemical manipulation in order to be always successful.

Q.—A mixture for aluminum electrical casting is desired.

A.—If the castings are required for the purpose of conducting electricity, then either pure aluminum or an alloy containing a very small percentage of alloying material should be used. Any alloying material reduces the electrical conductivity. Inasmuch as pure aluminum is soft and difficult to cast, we recommend an alloy of 94 per cent. of aluminum and 6 per cent. of copper for the purpose.

TRADE NEWS

Pig metals for New England brass founders is the specialty of Richards & Co., 60 Union street, Boston, Mass.

The R. B. Seidel (Philadelphia) Black Lead Crucible Works has been making crucibles for thirty-seven years.

The brass foundry of the Cramp Ship Yards, Philadelphia, reports that it casts a good deal of Parson's manganese bronze for automobiles.

The Monarch Brass Company, of Cleveland, Ohio, is settled in its new works, and is running to full capacity in the manufacturing of plumbers' supplies.

On another page will be found the offer of the patent right of the new German crucible furnace described in the August number of THE METAL INDUSTRY.

The J. W. Paxson Company, of Philadelphia, manufacturers and dealers in foundry supplies, can fill orders in one day's time for two dozen brass furnaces any size.

The Chapman Valve Company, of Indian Orchard, Mass., reports an unprecedented demand for its products. The plant is running to its utmost capacity. It is a noteworthy fact that all valve makers report excellent business at the present time.

The McKenna Brothers' Brass Company, of Pittsburgh, Pa., who are agents for "Blue Chip Steel," use this steel for roughening all of the brass machined in their establishment. The company had an exhibit of brass goods at the Pittsburgh September Exposition.

The Central Brass Company, of Cleveland, Ohio, is building an addition to its plant, which will be ready for occupancy early in October. The addition to their works will increase their capacity three times that at present, and give the Central people one of the best brass foundries in Cleveland.

The Phillips Insulated Wire Company, of Pawtucket, R. I., which rumor said was about to install a copper rod and wire mill, informs us that, while they are contemplating the starting of such a plant, they have not come to any decision in the matter. If they decide to begin the manufacture of rod and wire nothing will be done until Spring.

The Goodwin & Kitz Company, of Winsted, Conn., manufacturers of lamps, bronzes, spun work and fine metal goods, have found its present quarters entirely inadequate, and have moved into the five-story building known as the "shoe shop." This company is adding two brick buildings to the plant, and facilities are possessed for turning out work which it did not have before. The company report an excellent business outlook.

It is expected that the new plant of the Rome Metal Company will be rolling metal this Winter. The plant is owned and controlled by the Rome Brass and Copper Company, which also owns and controls the Rome Tube Company, the Rome Manufacturing Company and the Rome Novelty Works, all located at Rome, N. Y. It is said that the new mill of the Rome Metal Company will have the latest equipment, which will include electric motors on the smaller sized rolls. The combined companies employ several thousand men.

The Lawrenceville Brass Company, of Pittsburg, Pa., are now able to turn out 300,000 pounds of castings a month. The castings are mostly for rolling mill and blast furnace work.

The Pittsburgh White Metal Company, Pittsburgh, Pa., report that in the two years that their New York plant has been running they have increased their output 40 per cent.

The McCullough-Dalzell Crucible Company, of Pittsburgh, Pa., began making crucibles in 1872, and report that they have to-day the largest crucible plant in this country.

The Black Diamond File Works, of Philadelphia, are enlarging their plant. They have put in a new 7 horse power engine and have a new grinding room. By this enlargement they will increase their output 30 per cent.

By the first of November the Detroit Bronze and Plating Works will move to Port Huron, Mich., and will then change their name to the Port Huron Trunk Hardware Company. The company has a new plant, which will enable it to do three times the work of formerly.

During the last two years the S. Obermayer Company, of Cincinnati and Chicago, with branches in other cities, has increased its output 60 per cent., and yet is as busy as ever. The company will soon issue Catalogue No. 40, which will be a 350-page book, the largest of its kind relating to foundry supplies.

Michael Hayman & Co., of Buffalo, N. Y., smelters of metals, will in two months build a new plant, located on the outskirts of Buffalo, where they will have rail and water shipping facilities. They will be able to produce 25 tons of metal a day. Their present daily capacity is 12 tons.

The Detroit Copper and Brass Rolling Mills, of Detroit, Mich., have started their tube works, and are now prepared to furnish brass and copper tubes up to four inches in diameter. They have an improved method of making tube shells. The solid billet is pierced while hot. The process gives tubes of a solid and close grain.

At the Fall Festival Exposition, held in Cincinnati, O., during September, the E. W. Van Duzen Company had an exhibition of gongs and a general line of brass castings manufactured by the company. The company manufactured the five gongs which were presented to each of the officers of the Fall Festival. The gongs were highly polished, mounted on handsome standards and capped with the official exposition monogram. Mr. E. W. Van Duzen, the head of the company, is a pioneer in the metal business, having been engaged in it for sixty-four years. He takes a great interest in all alloys, new and old, and is the inventor of a number, and a bearing alloy known as "graphite metal."

TRADE NEWS

The Glauber Brass Manufacturing Company, of Cleveland, Ohio, has its new plant in complete operation.

The James A. Spargo Wire Company, of Rome, N. Y., have been running day and night to fill orders for copper wire.

The Metropolitan Aluminum Manufacturing Company, of New York, have moved its factory to 182 West Houston street, where it has larger quarters.

The Buckeye Aluminum Company, of Doylestown, Ohio, reports sufficient orders on hand to run the factory six months.

W. R. Witzer, C. J. Schmidt and H. A. Daggitt have incorporated the St. Charles Brass Manufacturing Company, of St. Charles, Ill., with a capital of $5,000.

The Eaton, Cole & Burnham Company, of Bridgeport, Conn., are adding no less than five new buildings to its already extensive plant. This company is constantly pursuing a policy of expansion, made necessary by the large increase for its goods.

Babu Hari Lal Mukherjee, of the Aluminum Warehouse, Calcutta, India, writes us that he has been seriously ill, but has recovered and regrets his inability to attend to business during his illness. He is now ready for work, and says that there is a demand for aluminum fancy goods in India, such as snuff boxes, cigarette cases, etc.

The United States Aluminum Castings Company, of Cincinnati, O., have just cast 500 refrigerator shelves. The refrigerators were for a New York hotel, and no expense was spared on the fittings. The United States Aluminum Company make regularly a large number of castings for patterns. In casting aluminum the company uses almost entirely snap flasks, and has one which is 30x30, said to be the largest snap flask ever sold in Cincinnati.

The new foundry which the Ajax Metal Company, of Philadelphia, is building, will be 83 x 150 feet, and will cover the site of the company's present yard and stable and old foundry at Richmond street and Frankford avenue. The new foundry will be finished in about two months, and will increase the company's output 33 per cent. The company has still further enlargements planned and under consideration, which are necessitated by the growing demand for Ajax Plastic Bronze. In the three years that this bearing metal has been on the market, the company has sold between seven and eight million pounds, and has orders in hand for a million pounds.

D. R. Steele, superintendent of the National Supply Company, Baltimore, Md., has been granted his patent for his melting furnace and burner. The fuel of the furnace is oil forced in by compressed air and the metal melted in a crucible which is not removed from the furnace in pouring. Mr. Steele says he can melt 100 pounds of brass with a 1 1-2 gallons of oil. His furnace has been in use for four years at the plant of the National Supply Company in melting brass for railroad bearings and general jobbing work. Where there were nineteen furnaces in operation of the old style there are now six of the Steele oil furnaces, and there is a considerable saving in the consumption of crucibles.

The Keller Brass Company, of Grand Rapids, Mich., manufacturers of metal furniture trimmings, is now one of the busiest concerns in the Wolverine State.

The plant of the Ferracute Machine Company, of Bridgeton, N. J., manufacturers of presses of every description was destroyed by fire on September 26.

The Damascus Bronze Company, of Pittsburgh, report that they are selling large quantities of their nickel bronze for railroad bearings.

The Great Western Smelting and Refining Company, of Chicago, report a heavy increase of business during the last six months at their San Francisco branch.

The Colton Manufacturing Company, of Montpelier, Vt., have greatly enlarged its brass foundry, and are now prepared to make brass, German silver and aluminum castings of all kinds, as well as do brass finishing and electro-plating.

A large bronze casting recently made by the Pittsburg Valve Foundry and Construction Company is an expansion joint slip for a steam line of the Jones & Laughlin blast furnace. The casting was 8 feet 4 1-2 inches long, 24 inches in diameter, 1-2 inch thick, and weighed 2,400 pounds.

The Brooklyn Brass & Copper Company, of Brooklyn, N. Y., whose plant was recently condemned by the bridge commission and purchased by the City of New York for the new bridge anchorage, has retired from business, but have not given out whether they intend to start again in other quarters.

The fine new plant of Clum & Atkinson, of Rochester, N. Y., is now employing 110 men. The building is 100x329, and is equipped with up-to-date appliances for the casting and finishing of brass in all forms. The company also handle Malta Phosphor tin and make a specialty of plumbers' supplies. This is the fourth time that the company has moved from outgrowing its old quarters. Their first shop room only measured 12x20.

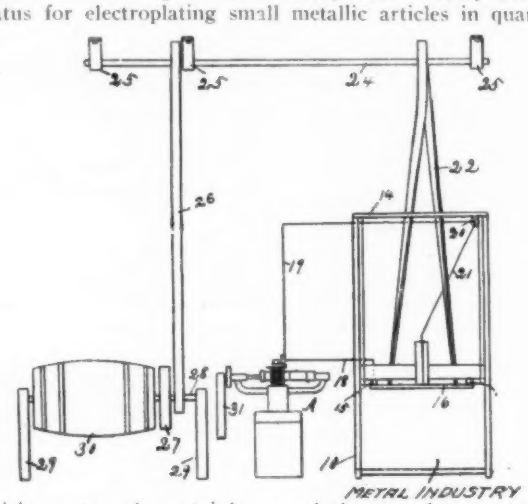
A Philadelphia firm which makes a fine window display of metal products is that of J. H. Jolly & Co., 42 North 5th street. Among the metallic products which they deal in are shot copper, shot nickel, shot aluminum for alloying metals, also guinea gold and French gray solder. This solder is used for brazing light gauge brass. They also handle copper shells which are used for automobiles, and they carry in stock everything in the form of brass and copper ingot, sheet, rod and tubing.

Metallic phosphoro, a species of phosphor tin, was first introduced to public notice about two years ago, by the New Era Manufacturing Company, of Kalamazoo, Michigan. It is claimed that this new product may be used for any of the purposes for which the old brands of phosphor tin are used, like results being obtained with a very much smaller per cent of the metal. The field in which it is at present attracting the most attention is as a tempering agent for Babbitt metals. Here it meets a requirement which gives it an almost universal demand among both manufacturers and consumers of machinery.

PATENTS

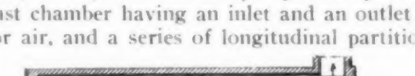
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

737,162. July 28, 1903. APPARATUS FOR ELECTROPLATING SMALL METALLIC ARTICLES. John F. Shelton, Fort Worth, Tex.—An apparatus for electroplating small metallic articles in quantities,



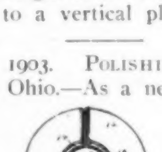
comprising a trough containing a solution, anodes suspended in said solution, a frame removably mounted in said trough, a wooden shaft mounted in the lower part of said frame, a perforated wooden cylinder mounted on said shaft, means for revolving said cylinder, means for making electrical connection with said anodes, and means for making electrical connection with each end of a mass of metallic articles moving in said cylinder during the revolution of said cylinder.

734,818. July 28, 1903. DUST CHAMBER FOR FURNACES. Frank Cazin, Denver, Colo., and Llewellyn J. W. Jones, Tacoma, Wash.—A dust chamber having an inlet and an outlet at its ends for the gas or air, and a series of longitudinal partitions extend-



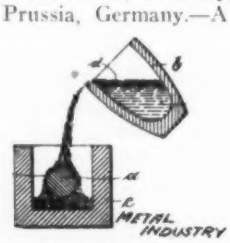
ing in the direction of the draft or current and subdividing the chamber between its inlet and outlet into a plurality of open-ended passages of less height than width, the said partitions being substantially inclined to a vertical plane passing longitudinally through the chamber.

734,581. July 28, 1903. POLISHING WHEEL. Clifford G. Lockwood, Hamilton, Ohio.—As a new article of manufacture,



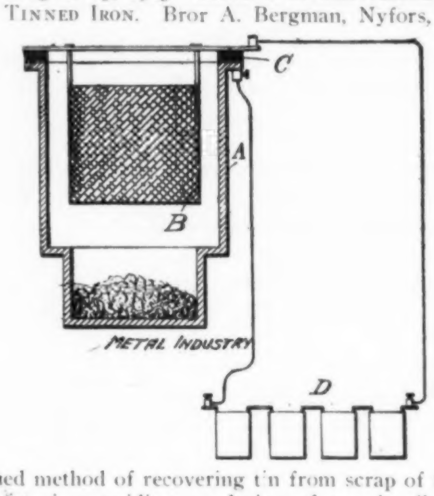
a taper wheel provided with a removable metal band having an open transverse seam, substantially as described and for the purpose specified.

735,244. August, 1903. PROCESS OF METAL WELDING. Hans Goldschmidt, Essen-on-the-Rhine, Germany, assignor to Clarence B. Schultz, Berlin, Prussia, Germany.—A process for welding



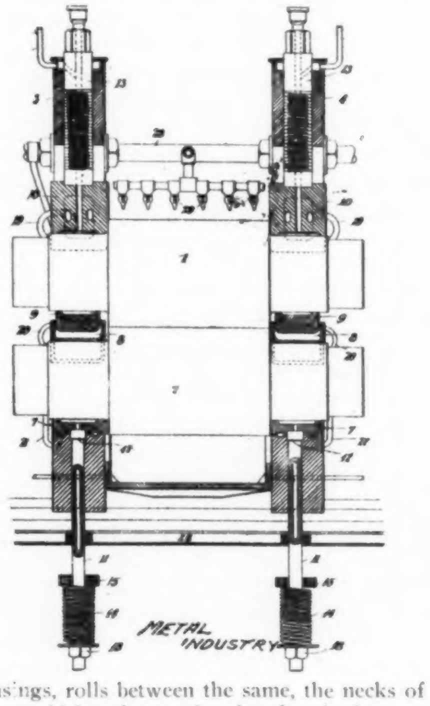
metal pieces, consisting in filling a crucible with a mixture of iron oxide and aluminum, igniting the mixture and casting the resulting products of the reaction taking place around the part to be welded, substantially as set forth.

736,924. August 25, 1903. METHOD OF RECOVERING TIN FROM SCRAPS OF TINNED IRON. Bror A. Bergman, Nyfors, Sweden.—



An improved method of recovering tin from scrap of tinned iron, which consists in providing a solution of caustic alkali containing a depolarizer, in placing said scrap as a negative pole and a metal electro-positive to the same as a positive pole in contact with said solution, permitting the tin to dissolve into stannate of the alkali, and to generate a current, and finally recovering the tin, substantially as described.

735,173. August 4, 1903. ROLLING MILL. Hugh L. Thompson, Waterbury, Conn.—In a rolling mill of the character described,



a pair of housings, rolls between the same, the necks of said rolls projecting into said housings, a bearing for the lower roll, a post projecting upward through said housing, the end of said post being enlarged and projecting into a recess in said bearing to retain the latter in position.

739,601. September 22, 1903. METAL-WORKING BY ELECTRICITY. Daniel E. Johnson, Hartford, Conn.—In combination, an electric welding device; a circuit carrying a single-phase alternating current to said device from the secondary element of a transformer; said transformer; a plurality of circuits carrying alternating currents of different phases to the primary elements of a second transformer; and said second transformer, the secondary elements of which are bridged and connected with the primary element of said first-named transformer.

Metal Prices, October 5, 1903

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malaca	27.00
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	13.50
Electrolytic	13.25
Casting	13.00
SPELTER—Duty 1c. per lb.	
Western	5.87½
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.50
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	7.25
Hallets	6.75
Other	6.25
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 60
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.60
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask	47.50

Sheet Lead, 7¾c. per lb., 20 per cent. off.
Lead Pipe, 6¾c. per lb., 20 per cent. off.
Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 7.50c. per lb., open, 8c. per lb.
Tobin Bronze—Rods, Unfinished, 19c.
Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.00c.	12.00c.
Copper Wire	10.50c.	11.75c.
Light Copper	9.50c.	10.25c.
Heavy Mach. Comp.	10.25c.	11.25c.
Heavy Brass	7.00c.	8.00c.
Light Brass	5.75c.	6.25c.
No. 1 Yellow Brass Turnings	6.75c.	7.50c.
No. 1 Comp. Turnings	9.00c.	10.00c.
Heavy Lead	4.10c.	4.40c.
Zinc Scrap	4.45c.	4.50c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins	Not longer than 72 ins.	20	21	21	21	21	22
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	22
	Longer than 96 ins.	20	21	21	21	21	23
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	20	21	21	21	21	23
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	23
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	21	22	24
	Longer than 120 ins	20	21	21	22	23	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	20	21	21	22	23	25
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	22	24	26
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	23	25	29
	Longer than 120 ins.	20	21	22	24	27	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	20	21	21	22	24	27
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	23	25	30
	Longer than 96 ins Not longer than 120 ins.	20	21	22	24	27	
	Longer than 120 ins	21	22	23	25	29	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	20	21	22	24	29	
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26	31	
	Longer than 120 ins.	21	22	24	29		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	21	22	24	27		
	Longer than 96 ins. Not longer than 120 ins.	22	23	25	28		
	Longer than 120 ins.	23	24	26	30		
Wider than 108 ins.	Not longer than 132 ins.	24	25	27			
	Longer than 132 ins.	25	26	29			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, October 5, 1903

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb.................. 25c.
12 oz. and up to 14 oz. to square foot, per lb.............. 26c.
10 oz. and up to 12 oz...................................... 28c.
Lighter than 10 oz.. 31c.
Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order. Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26........	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28........	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc..................	$0.23	$0.27	$0.31
Above No. 10 to No. 16..................	.23½	.27½	.31½
Nos. 17 and 18..........................	.24	.28	.32
" 19 and 20............................	.25	.29	.33
No. 21..................................	.26	.30	.34
" 22....................................	.27	.31	.35
" 23....................................	.28	.32	.36
" 24....................................	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING

From 2 in. to 3¾ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.
For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.....	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.......	33	29	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

	Per lb.
Plain Round Tube, ¾ in. up to 2 in., to No. 19, inc.	$0.35
" " " ⅝ " " ¾ " " 19, "	36
" " " ½ " " ⅝ " " 19, "	38
" " " ⅜ " " ½ " " 19, "	41
" " " 5/16 " " ⅜ " " 19, "	48
" " " ¼ " " 5/16 " " 19, "	65
" " " 3/16 " " ¼ " " 19, "	1.06
" " " ⅛ " " 3/16 " " 19, "	1.50
Smaller than ⅛ inch..........	Special
2 inch to 3 inch, to No. 19, inclusive..........	38
3 inch..........	40
Over 3 inch to 3½ inch..........	45
Over 3½ inch..........	50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than.. ... And Including...	*3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier..	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 14..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 15..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	7
" 16..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	8
" 17..........	......	42	44	44	44	44	47	47	47	48	48	49	50	3	9
" 18..........	......	42	41	44	44	44	47	47	50	51	51	54	57	3	10
" 19..........	......	42	44	44	44	44	47	48	51	52	52	56	59	4	11
" 20..........	42	44	44	44	44	46	49	50	52	53	53	58	61	4	12
" 21..........	42	46	46	46	46	48	51	52	58	50	62	65	.....	5	14
" 22..........	42	46	46	46	48	48	51	55	59	61	64	.....	.....	5	16
" 23..........	42	46	46	46	48	48	51	57	60	64	.....	.....	.....	6	18
" 24..........	42	46	48	50	50	50	53	59	62	.....	.....	.....	.....	6	20
" 25..........	44	47	49	51	51	51	54	61	.....	.....	.....	.....	.....	7	23
" 26..........	44	47	50	54	54	54	59	.....	.....	.....	.....	.....	.....	8	25
" 27..........	44	48	52	56	56	57	62	.....	.....	.....	.....	.....	.....	10	28
" 28..........	44	48	54	56	57	57	64	.....	.....	.....	.....	.....	.....	11	32
" 29..........	46	49	56	58	60	60	69	.....	.....	.....	.....	.....	.....	13	36
" 30..........	46	50	58	60	64	70	77	.....	.....	.....	.....	.....	.....	15	40
" 31..........	48	52	60	63	68	76	.....	.....	.....	.....	.....	.....	.....	17	44
" 32..........	50	54	62	66	74	82	.....	.....	.....	.....	.....	.....	.....	19	50
" 33..........	52	56	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	57
" 34..........	55	60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25	66
" 35 & 36.......	1 67	Not wider than 6 in.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Polished two sides double above prices.	Satin Finish two sides double above prices.
" 37 & 38.......	1 98		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
" 39 & 40.......	2 22		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
".003" to .0015"..	2 42		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
Less than .0015"..	2 66		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds.......................10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.		Outside Diameter in Inches.
1-4......	......	......	......	10	9	8	7		1-4
5-16......	......	......	......	11	9	8	7		5-16
3-8......	......	......	......	12	9	8	7		3-8
1-2......	......	......	17	14	11	9	8		1-2
5-8......	......	......	21	16	13	12	......		5-8
3-4......	......	......	25	19	16	14	......		3-4
7-8......	......	......	28	22	18	16	......		7-8
1.........	......	......	30	25	21	19	......		......1 00
1 1-4......	......	......	36	30	25	......	......		......1 1 4
1 1-2......	......	52	43	35	28	......	......		......1 1-2
1 3-4......	......	60	50	41	33	......	......		......1 3-4
2.........	84	68	58	47	37	......	......		......2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38¾	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

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